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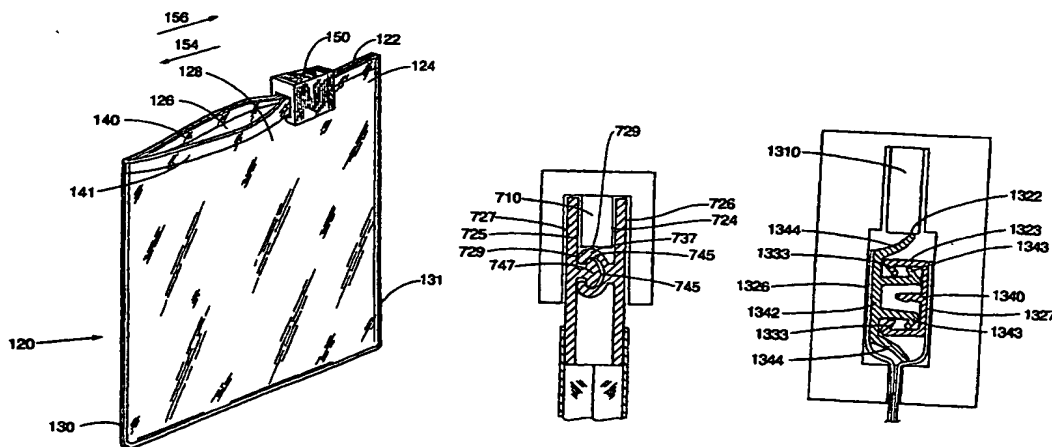
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(54) Title: CLOSURE DEVICE



(57) Abstract: The closure device includes a first fastening strip (240) and a second fastening strip (241) arranged to be interlocked over a predetermined length and a slider (200) with an engaging finger (210). The slider (200) facilitates the occlusion and deocclusion of the fastening strips (240, 241) when moved along the fastening strips. One or both of the fastening strips also includes an uneven surface (250) having protrusions (252). When the slider is moved along the fastening strips, the engaging finger (210) contacts the uneven surface (250). The contact between the engaging finger (210) and the uneven surface (250) produces a sensory indication of movement of the slider (200). The sensory indication may include a tactile indication and/or an audible indication.

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CLOSURE DEVICE

FIELD OF THE INVENTION

The present invention pertains to an interlocking closure device, and, more particularly, to a closure device with a slider. The closure device of the present invention may be employed in traditional fastener areas, and is particularly suited for use as a fastener for storage containers, such as plastic bags.

BACKGROUND OF THE INVENTION

The use of fastening devices for the closure of containers, including plastic bag bodies, is generally known. Furthermore, the manufacture of fastening devices made of plastic materials is generally known to those skilled in the art relating to closure devices, as demonstrated by the numerous patents in this area.

A particularly well-known use for fastening devices is in connection with flexible containers, such as bag bodies. The closure device and the associated container may be formed from thermoplastic materials, and the closure device and sidewalls of the container can be integrally formed by extrusion as a single piece. Alternatively, the closure device and sidewalls may be formed as separate pieces and then connected by heat sealing or any other suitable connecting process. The closure devices when incorporated as fasteners on bag bodies have been particularly useful in providing a closure means for retaining the contents within the bag body.

Conventional closure devices utilize mating male and female closure elements which are occluded. When conventional closure devices are employed, it often is

difficult to determine when the male and female closure elements are occluded. This problem is particularly acute when the closure devices are relatively narrow. Accordingly, when conventional closure devices are employed, there exists a reasonable likelihood that the closure device is at least partially open.

The prior art has attempted to furnish a fastener that provides a tactile or audible indication of occlusion. For example, U.S. Patents 4,736,496, 5,138,750, 5,140,727, 5,403,094, and 5,405,478, as well as EP 510,797, disclose closure devices that allegedly provide a tactually or audibly perceptible indication of proper interlocking of the closure elements. It is said that, upon occlusion of the disclosed closure devices, a user is able to feel or hear that full closure is accomplished. For example, U.S. Patent 4,736,946 discloses the use of additional ribs on either side of the closure elements. These ribs are said to give an improved "feel" to the closure, thus aiding a user in aligning the closure elements.

Such devices are difficult to handle by individuals who have limited manual dexterity. Thus, in order to assist these individuals and for ease of use by individuals with normal dexterity, the prior art has attempted to furnish a fastener that provides a reclosable fastener and a slider for opening and closing the fastener. For example, several U.S. Patents disclose fasteners with sliders. However many of these fasteners use either: (1) a separator finger which extends between the closure elements, such as U.S. Patents 3,054,434, 3,115,689, 3,122,807, 3,230,593, 3,426,396, 3,713,923, 4,199,845, 4,262,395, 5,007,142, and 5,010,627 (Figs. 9 and 10); or (2) the separator finger runs along a track

above the closure elements, such as, U.S. Patents 5,007,143, 5,010,627 (Figs. 3-8), 5,020,194, 5,067,208, 5,070,583, 5,088,971, 5,131,121, 5,161,286, 5,283,932, 5,301,395, 5,426,830, 5,442,837 and 5,448,808.

It is an object of the present invention to provide a tactually and/or audibly perceptible indication of occlusion or deocclusion of the closure device by employing a slider that provides a tactile and/or audible indication of occlusion and/or deocclusion of the closure device.

BRIEF SUMMARY OF THE INVENTION

The present invention satisfies these general objects by providing a closure device with interlocking fastening strips and a slider which establishes a leak proof seal. The closure device comprises first and second interlocking fastening strips arranged to be interlocked over a predetermined length and a slider with an engaging finger. The slider facilitates the occlusion and deocclusion of the fastening strips when the slider is moved relative to and substantially parallel with the first and second interlocking fastening strips. The closure device further comprises an uneven surface having protrusions. The protrusions sequentially contact the engaging finger as the slider is moved relative to and substantially parallel with the first and second interlocking fastening strips. The sequential contact of the engaging finger with the protrusions provide a tactually and/or audibly perceptible indication of occlusion or deocclusion of the closure device.

DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a container according to the present invention in the form of a plastic bag.

Fig. 2 is an enlarged partial top view of the container in Fig. 1.

Fig. 3 is an enlarged partially cut away side view of one embodiment of the invention showing an uneven surface having protrusions that are disposed upwardly and the engaging finger of the slider located near the end of the slider.

Fig. 4 is an enlarged partially cut away side view of another embodiment of the invention showing an uneven surface having protrusions that are disposed upwardly and the engaging finger of the slider located approximately in the center of the slider.

Fig. 5 is an enlarged partially cut away top view of another embodiment of the invention showing two uneven surfaces having protrusions that are disposed outwardly and engaging fingers of the slider located near the end of the slider.

Fig. 6 is an enlarged partially cut away top view of another embodiment of the invention showing two uneven surfaces having protrusions that are disposed outwardly and engaging fingers of the slider located approximately in the center of the slider.

Fig. 7 is a partially cut away top view of another embodiment of the invention showing multiple engaging fingers for each uneven surface.

Fig. 8 is a cross-sectional view taken along line 8-8 in Fig. 2 of another embodiment.

Fig. 9 is a partially cut away top view of one of the embodiments in Fig. 8.

Fig. 10 is a partially cut away top view of one of the embodiments in Fig. 8.

Fig. 11 is a cross-sectional view of another embodiment.

Fig. 12 is a side or top view showing the uneven surface with protrusions shaped as semi-circles.

Fig. 13 is a side or top view showing the uneven surface with protrusions shaped as triangles.

Fig. 14 is a side or top view showing the uneven surface with rounded-shaped protrusions.

Fig. 15 is a side view or top view showing variable spacing between protrusions.

Fig. 16 is a side view or a top view showing a difference in protrusion height between protrusions.

Fig. 17 is a side view or a top view showing a difference in protrusion width between protrusions.

Fig. 18 is a partial cross-sectional view taken along line 18-18 in Fig. 2 of an occluded z-axis or shearing action interlocking closure device.

Fig. 19 is a partial cross-sectional view taken along line 19-19 in Fig. 2 showing an occluded U-channel interlocking closure device.

Fig. 20 is a partial cross-sectional view taken along line 20-20 in Fig. 2 showing an occluded arrow-head interlocking closure device.

Fig. 21 is a partial cross-sectional view taken along line 21-21 in Fig. 2 showing an occluded rolling-action interlocking closure device.

While the invention will be described and disclosed in connection with certain embodiments and procedures, it is not intended to limit the invention to those specific embodiments. Rather it is intended to cover all such embodiments and modifications as fall within the spirit and scope of the invention.

DESCRIPTION OF THE EMBODIMENTS

The present invention provides interlocking closure devices with a slider which provide a sensory indication, such as, audible and/or tactile indication, of occlusion and deocclusion. Generally, the closure device comprises a first and a second interlocking fastening strip that are substantially parallel relative to each other and arranged to be interlocked over a predetermined length by a slider having an engaging finger. The slider facilitates the occlusion and deocclusion of the fastening strips when the slider is moved relative to and substantially parallel with the first and second interlocking fastening strips. The closure device is further comprised of an uneven surface having protrusions. The protrusions sequentially contact the engaging finger as the slider is moved relative to and substantially parallel with the first and second interlocking fastening strips.

Figs. 1 and 2 illustrate a container according to the present invention in the form of a plastic bag 120 having

a sealable closure device 122. The plastic bag includes a top end 124, a first side wall 126 and a second side wall 128 joined at seams 130, 131 to define a compartment open on the top but sealable by means of the closure device. The closure device comprises a first fastening strip 140, a second fastening strip 141 and a slider 150. The slider can move in either a first direction 154 or a second direction 156. Both directions of slider motion are substantially parallel with both fastening strips.

The first fastening strip 140 is attached near the top of the first side wall 126. The second fastening strip 141 is attached near the top of the second side wall 128. Each fastening strip is located across from and substantially parallel with the other fastening strip. The slider 150 is located at the top of the plastic bag and straddles both fastening strips. The slider 150 slidably engages each of the fastening strips 140, 141 so that the slider is moved relative to and substantially parallel with the fastening strips. The fastening strips 140, 141 either occlude or deocclude depending upon the direction of travel of the slider 150.

Fig. 3 shows one embodiment of the invention which includes an engaging finger and an uneven surface with protrusions that contact the engaging finger. In Fig. 3, the slider 200 includes an engaging finger 210. The engaging finger has a first end 212 and a second end 214. The slider further includes a first end 220, a second end 222, a first side 224, a second side 226, a top 228 and a bottom 230. The bottom includes a first shoulder 236 and a second shoulder 238 which define a slot 239. One or both of the fastening strips 240, 241 includes an uneven surface 250. The uneven surface is comprised of several protrusions 252.

The first end 212 of the engaging finger is integral with the top 228 of the slider. The engaging finger 210 extends downwardly from the top of the slider toward the bottom of the slider and is located close to the second end 222 of the slider. The uneven surface 250 may include several protrusions 252. The protrusions extend upwardly from the top of the first fastening strip 140, the second fastening strip 141 or both fastening strips toward the top of the slider. The second end 214 of the engaging finger sequentially contacts each of the protrusions 252 as the slider is moved substantially parallel to the fastening strips. For example, if the slider is moving in the right to left or occlusion direction 254 as shown in Fig. 3, the finger 210 deflects over the first protrusion 270. After the finger clears the first protrusion, the finger 210 contacts the next protrusion 272 and/or the surface 216 adjacent the finger 210. When the finger contacts the second protrusion 272 and/or the surface 216 adjacent to the finger, the contact generates an audible and/or tactile sensation for the user. The sensation continues as the user moves the slider along the fastening strips 140, 141. In addition, the sensation may also occur when the slider is moved in the opposite deocclusion direction 256 as shown in Fig.3. This sensation provides an audible and/or tactile indication that the fastening strips are occluding or deoccluding.

Fig. 4 illustrates another embodiment of the invention in which similar components of the closure device are similarly numbered as in Fig. 3. The embodiment of the invention illustrated in Fig. 4 positions the engaging finger near the center of the slider. In Fig. 4, the engaging finger 310 is located approximately midway between the first end 320 of the

slider 300 and the second end 322 of the slider. The engaging finger 310 contacts the uneven surface 350 having protrusions 352 in the same manner as set forth in the description of Fig. 3. However, in comparison to Fig. 3 after the finger 310 clears the first protrusion, the finger 310 may contact the next protrusion, the surface 316 or the surface 317 depending upon the movement direction 354, 356 of the slider 300.

Fig. 5 illustrates another embodiment of the invention which includes two engaging fingers and two uneven surfaces with protrusions that sequentially contact their respective engaging finger. In addition, the engaging finger in Fig. 5 contacts the side of the fastening strips in comparison to the embodiments in Figs. 3 and 4 wherein the finger contacts the top of the fastening strip. Specifically, in Fig. 5, the slider 400 includes a first engaging finger 410. The first engaging finger has a first end 412 and a second end 414. The slider also includes a second engaging finger 460 having a first end 462 and a second end 464. The slider further includes a first end 420, a second end 422, a first side 424, a second side 426, a top 428 and a bottom 430. The bottom is comprised of a first shoulder 436 and a second shoulder 438 which together define a slot 439. The first fastening strip 440 includes an uneven surface 450 which is comprised of a first series of protrusions 452. The second fastening strip 441 includes an uneven surface 470 which is comprised of a second series of protrusions 472.

The first end 412 of the first engaging finger is integrally connected to the first side 424 of the slider. The first engaging finger 410 extends inwardly from the first side 424 of the slider toward the center of the slider. The first engaging finger 410 is located close to

the second end 422 of the slider.

The first end 462 of the second engaging finger is integrally connected to the second side 426 of the slider. The second engaging finger 460 extends inwardly from the second side 426 of the slider toward the center of the slider. The second engaging finger 460 is located close to the second end 422 of the slider.

The first series of protrusions 452 extend outwardly from the first fastening strip 440. The second end 414 of the first engaging finger sequentially contacts each protrusion that comprises the first series of protrusions 452. The second series of protrusions 472 extend outwardly from the second fastening strip 441. The second end 464 of the second engaging finger sequentially contacts each protrusion that comprises the second series of protrusions 472. As the slider 400 is moved along the first and second fastening strips, the engaging fingers 410, 460 contact the uneven surfaces 450, 470. Specifically, the second end 414 of the first engaging finger sequentially contacts each of the protrusions that comprise the first series of protrusions 452 and the second end 464 of the second engaging finger sequentially contacts each of the protrusions that comprise the second series of protrusions 472. For example, if the slider is moving in the occlusion direction 454 as shown in Fig. 5, the first engaging finger 410 deflects over the first protrusion in the first series of protrusions 452 and the second engaging finger 460 deflects over the first protrusion in the second series of protrusions 472. After the first engaging finger 410 clears the first protrusion in the first series of protrusions, the finger 410 contacts the next protrusion and/or the surface 416 adjacent the first engaging finger 410. When the first

engaging finger 410 contacts the second protrusion in the first series of protrusions and/or the surface 416 adjacent to the finger, the contact generates an audible and/or tactile sensation for the user. The sensation continues as the user moves the slider along the fastening strips.

The tactile and/or audible sensation created by the movement of the slider is enhanced by the use of the second engaging finger 460. The second engaging finger 460 contacts the second series of protrusions 472 and/or the surface 466 adjacent to the second engaging finger 460 in the same manner as the first engaging finger contacts the first series of protrusions as the slider is moved along the fastening strips. In addition, the sensation may also occur when the slider 400 is moved in the deocclusion direction 456 as shown in Fig. 5. This sensation provides an audible and/or tactile indication that the slider is moving and that the fastening strips are occluding or deoccluding.

This feature of the engaging finger engaging the side of the fastening strip(s) may be used as appropriate with any of the embodiments herein.

As an example of another embodiment, first and second engaging fingers may be at any location on the slider and may engage the top of a fastening strip(s), third and fourth engaging fingers may be at any location on the slider and may engage respective sides of the fastening strips and additional engaging fingers as desired may be located to engage the side(s), the top, the bottom, and/or the interior of the top of the fastening strips as desired and appropriate.

Fig. 6 illustrates another embodiment of the invention in which similar components of the closure device are similarly numbered as in Fig. 5. The embodiment of the invention illustrated in Fig. 6 positions the first engaging finger 510 and the second engaging finger 560 across from each other and located approximately midway between the first end 520 of the slider 500 and the second end 522 of the slider. The first engaging finger 510 contacts the first uneven surface 550 having protrusions 552 in the same manner as set forth in the description of Figs. 4 and 5. Likewise, the second engaging finger 560 contacts the second uneven surface 570 having protrusions 572 in the same manner as set forth in the description of Figs. 4 and 5.

The slider may include two or more fingers engaging one surface of the fastening strips. Referring to Fig. 7, the closure device is similar to the closure device in Fig. 5 except the slider 600 has three engaging fingers 610, 611, 613, 660, 661, 663 on each side of the fastening strips 640, 641. The three fingers 610, 611, 613 engage the uneven surface 650 and the three fingers 660, 661, 663 engage the uneven surface 670. This feature of two or more fingers engaging one uneven surface may be used as appropriate with any of the embodiments herein.

The engaging finger(s) may also engage the interior surface(s) of the fastening strip(s). Referring to Fig. 8, the closure device is similar to the other embodiments except an engaging finger 710 may engage an uneven surface which is located on an inside surface 724 on a first side 726, an inside surface 725 on a second side 727, a surface 729 of a first closure portion 737, and/or a surface 745 of a second closure portion 747. For example, in the embodiment shown in Fig. 9, the inside surface 724 has an

uneven surface 750 and the inside surface 725 has an uneven surface 770. The engaging finger 710 may engage one or both of the surfaces 750, 770. In the embodiment shown in Fig. 10, the surface 729 on the first closure portion has an uneven surface 771 and the engaging finger 710 engages the surface 771. Similarly, as shown in Fig. 11, the surface 845 on the second closure portion may have an uneven surface and the engaging finger 810 engages the uneven surface on surface 845. As shown in Fig. 8, the engaging finger 710 may contact one or more surfaces. In addition, the engaging finger 710 may be used with other engaging fingers on the same uneven surface. Also, the engaging finger 710 and its corresponding uneven surface may be used in combination with other engaging fingers 776, 778 on other uneven surfaces as shown in Figs. 9 and 10. Furthermore, the engaging finger 710 may also be the separator finger or may operate independently of the separator finger.

In another embodiment, the engaging finger(s) may contact an uneven surface on the sidewall(s) of the bag.

Referring generally to Figs. 12-17, the uneven surface may have several different shapes and/or configurations. For example, the uneven surface may have square or rectangular protrusions of uniform height, width and spacing as shown in Figs. 3, 4, 5 and 6. However, variously shaped protrusions can be interchanged or combined with the square or rectangular protrusions illustrated in Figs. 3, 4, 5 and 6. Furthermore, independent of the shape of the protrusion, the height, width and/or spacing of the protrusions can be equal or can be altered.

Referring to Fig. 12, the uneven surface 900 includes

semi-circularly shaped protrusions 910 that extend upwardly or outwardly from a fastening strip 920. The semi-circularly shaped protrusions extend upwardly in a side view and outwardly in a top view.

Referring to Fig. 13, the uneven surface 930 includes triangularly shaped protrusions 940 that extend upwardly or outwardly from a fastening strip 950. The triangularly shaped protrusions extend upwardly in a side view and outwardly in a top view.

Referring to Fig. 14, the uneven surface 960 includes rounded protrusions 970 that extend upwardly or outwardly from a fastening strip 980. The rounded shaped protrusions extend upwardly in a side view and outwardly in a top view.

Referring to Fig. 15, the spacing between protrusions may be unequal while maintaining a constant width and a constant height of each individual protrusion. In Fig. 15, the uneven surface 1000 has a first spacing 1002 between a first protrusion 1004 and a second protrusion 1006 that is greater than the second spacing 1008 between the second protrusion and the third protrusion 1010. The height of the first protrusion 1012 is the same as the height for all the protrusions in Fig. 15. Likewise, the width of the first protrusion 1014 is the same as the width for all the protrusions in Fig. 15. In other embodiments, the height and/or the width of the protrusions may also be unequal.

Referring to Fig. 16, the height difference between protrusions may be unequal while maintaining a constant width of each protrusion and a constant spacing between protrusions. In Fig. 16, the uneven surface 1120 includes

a first protrusion 1122 having a first height 1124 and a second protrusion 1126 having a second height 1128. The height of the first protrusion is greater than the height of the second protrusion and each protrusion thereafter may sequentially decrease in height. The spacing between the first protrusion and the second protrusion 1130 is equal to the spacing between subsequent consecutive protrusions in Fig. 16. Likewise, the width of the first protrusion 1132 is the same as the width for all the protrusions in Fig. 16. In other embodiments, the spacing and/or the width of the protrusions may also be unequal.

Referring to Fig. 17, the width difference between protrusions may be unequal while maintaining a constant height of each protrusion and a constant spacing between protrusions. In Fig. 17, the uneven surface 1140 includes a first protrusion 1142 having a first width 1144 and a second protrusion 1146 having a second width 1148. The width 1144 of the first protrusion is greater than the width 1148 of the second protrusion and each protrusion thereafter may sequentially decrease in width. The spacing 1150 between the first protrusion 1142 and the second protrusion 1146 is equal to the spacing between subsequent consecutive protrusions in Fig. 17. Likewise, the height 1152 of the first protrusion 1142 is the same as the height for other protrusions in Fig. 17. In other embodiments, the spacing and/or the height of the protrusions may also be unequal.

In another embodiment, the audible and/or tactile sensation may be a first sensation in the occlusion direction and a second sensation in the deocclusion direction. Thus, the user can determine the direction of the slider by the sensation. These two different

sensations may be accomplished by varying the shapes of the protrusions, the height, the width, the spacing of the protrusions, the location or the shape of the engaging finger(s), and/or the material composition of the engaging finger(s) or the uneven surface(s). Similarly, these factors can be used to select an appropriate sensation even if a single sensation is desired for occlusion and deocclusion. Furthermore, these factors can be used to select or vary the sensation at predetermined location(s) on the fastening strip(s), such as, near the ends of the fastening strip(s).

The uneven surface may be manufactured by rolling a wheel with notches or the appropriate shape along the predetermined surface.

The interlocking fastening strips of the present invention may be of virtually any type or form. For example, the interlocking fastening strips may comprise "shear action" or "Z-axis" closure strips, as shown in FIG. 18. Shear action closure strips include a first fastening strip 1231 and a complementary second fastening strip 1241 which engage upon moving the slider member 1200 in the occlusion direction. With shear action closure elements, the engaging finger 1210 may engage the upper surface 1222 of the first fastening strip 1231, as shown, for example, in FIG. 18. In another embodiment, the engaging finger may engage one or both of the sides 1226, 1227 of the fastening strips as noted above.

The interlocking fastening strips may optionally comprise U-channel closure strips as shown in Fig. 19. U-channel closure strips include a first fastening strip 1332 with hook portions 1333, and an associated second fastening strip 1342 with inner hook portions 1343 and

outer wings 1344. With U-channel closure elements, the engaging finger 1310 may engage the upper surface 1322 of one of the outer wings 1344, as shown in FIG. 19. If the fastening strip does not include wings 1344, then the engaging finger 1310 engages the upper surface 1323. In another embodiment, the engaging finger may engage one or both of the sides 1326, 1327 of the fastening strips as noted above.

In addition, the interlocking fastening strips may alternatively comprise arrowhead-type closure strips, as shown in FIG. 20. As described more fully in U.S. Patents 5,007,142 and 5,020,194 arrowhead-type closure strips typically include a first fastening strip 1446 with an arrowhead-shaped engagement portion 1447, and an associated second fastening strip 1436 with a cup-shaped engagement portion 1437. In use, the first fastening strip 1446 and the second fastening strip 1436 and are selectively occluded and deoccluded by moving the slider member in the appropriate direction. This occlusion/deocclusion action is usually accomplished by a separator finger 1482 (only a portion of which is shown) which projects downwardly from the top portion 1472 of the slider member between the first fastening strip 1446 and the second fastening strip 1436. With arrowhead-type closure elements, the engaging finger 1410 may engage the upper surface 1422 of one or both of the fastening strips 1446 and 1436, as shown, for example, in FIG. 20. In another embodiment, the engaging finger may engage one or both of the sides 1426, 1427 of the fastening strips as noted above.

The interlocking fastening strips may optionally comprise rolling action closure strips, as shown, for example, in FIG. 21. As described in greater detail in

U.S. Patent No. 5,007,143, rolling action closure strips include interlocking elements 1548 and 1538. This rolling action is usually accomplished by a separator finger 1582 (only a portion of which is shown) which projects downwardly from the top portion 1572 of the slider member. With such rolling action closure elements, the engaging finger 1510 may engage the upper surface 1522 of one or both of the elements 1548 and 1538, as shown, for example, in FIG. 21 or may engage one or both of the sides 1526, 1527 of the fastening strips as noted above.

Although several interlocking fastening strip embodiments have been specifically described and illustrated herein, it will be readily appreciated by those skilled in the art that other kinds, types, or forms of fastening strips may alternatively be used without departing from the scope or spirit of the present invention.

The slider may be a one piece construction or may include several separate pieces which are assembled in several different ways. The slider may be manufactured by injection molding or any other method. The slider may be formed from thermoplastic materials such as, polypropylene, high density polyethylene, ABS, polystyrene, nylon, acetal, toughened acetal, polyketone, polybutylene, terephthalate or polycarbonate. The slider may be clear, opaque or colored.

The interlocking fastening strips of the present invention may be manufactured by extrusion through a die. The die should be made somewhat larger than the desired final dimensions of the fastening strips, inasmuch as shrinkage of the extruded fastening strips is likely upon cooling. In addition, the fastening strips should be

manufactured to have approximately uniform cross-sections. This not only simplifies the manufacturing of a closure device, but also contributes to the physical flexibility of the closure device.

Generally, the interlocking fastening strips of the present invention may be formed from any suitable thermoplastic material including, for example, polyethylene, polypropylene, nylon, or the like, or from a combination thereof. Thus, resins or mixtures of resins such as high density polyethylene, medium density polyethylene, and low density polyethylene may be employed to prepare the interlocking fastening strips of the present invention. In most instances, the fastening strips are preferably made from low density polyethylene. The selection of the appropriate thermoplastic material, however, is related to the particular design of the fastening strips, the Young's Modulus of the thermoplastic material, and the desired elasticity and flexibility of the strips.

When the fastening strips of the present invention are used in a sealable bag, the fastening strips and the films that form the body of the bag may be conveniently manufactured from heat sealable material. In this way, the bag may be economically formed by using an aforementioned thermoplastic material and by heat sealing the fastening strips to the bag. In most instances, the bag is preferably made from a mixture of high pressure, low density polyethylene and linear, low density polyethylene.

The fastening strips of the present invention may be manufactured by extrusion or other known methods. For example, the closure device may be manufactured as

individual fastening strips for later attachment to the bag or may be manufactured integrally with the bag. In addition, the fastening strips may be manufactured with or without flange portions on one or both of the fastening strips depending upon the intended use of the closure device or expected additional manufacturing operations.

Generally, the closure device of the present invention can be manufactured in a variety of forms to suit the intended use. In practicing the present invention, the closure device may be integrally formed on the opposing side walls of the container or bag, or connected to the container by the use of any of many known methods. For example, a thermoelectric device may be applied to a film in contact with the flange portion of the fastening strips or the thermoelectric device may be applied to a film in contact with the base portion of fastening strips having no flange portion, to cause a transfer of heat through the film to produce melting at the interface of the film and a flange portion or base portion of the fastening strips. Suitable thermoelectric devices include heated rotary discs, traveling heater bands, resistance-heated slide wires, and the like. The connection between the film and the fastening strips may also be established by the use of hot melt adhesives, hot jets of air to the interface, ultrasonic heating, or other known methods. The bonding of the fastening strips to the film stock may be carried out either before or after the film is U-folded to form the bag. In any event, such bonding is done prior to side sealing the bag at the edges by conventional thermal cutting. In addition, the first and second fastening strips may be positioned on opposite sides of the film. Such an embodiment would be suited for wrapping an object or a collection of objects such as wires. The first and second fastening strips should

usually be positioned on the film in a generally parallel relationship with respect to each other, although this will depend on the intended use.

In summary, the present invention provides a closure device that overcomes many of the drawbacks inherent in the prior art. More specifically, the present invention affords a closure device with interlocking fastening strips, a slider member which facilitates the occlusion and deocclusion of the fastening strips, and an engaging portion which produces an audible indication of movement of the slider.

From the foregoing it will be understood that modifications and variations may be effectuated to the disclosed structures — particularly in light of the foregoing teachings — without departing from the scope or spirit of the present invention. As such, no limitation with respect to the specific embodiments described and illustrated herein is intended or should be inferred. Indeed, the following claims are intended to cover all modifications and variations that fall within the scope and spirit of the present invention. In addition, all references and copending applications cited herein are hereby incorporated by reference in their entireties.

WHAT IS CLAIMED IS:

1. A closure device, comprising, a first fastening strip and a second fastening strip arranged to be interlocked over a predetermined length, one of said fastening strips having a first uneven surface, a slider with a first engaging finger, said slider having a first end and a second end, said slider facilitates the occlusion of said fastening strips when moved toward a first end of said fastening strips and deocclusion of said fastening strips when moved towards a second end of said fastening strips by slidably engaging said first and said second fastening strips, said first engaging finger contacts said first uneven surface, said contact between said first engaging finger and said first uneven surface produces a sensory indication of movement of said slider.

2. The invention as in claim 1 wherein said contact between said first engaging finger and said first uneven surface produces a tactile indication of occlusion of said interlocking fastening strips.

3. The invention as in claim 1 wherein said contact between said first engaging finger and said first uneven surface produces an audible indication of occlusion of said interlocking fastening strips.

4. The invention as in claim 1 wherein said first engaging finger is located substantially near said first end of said slider.

5. The invention as in claim 1 wherein said first engaging finger is located substantially near said second end of said slider.

6. The invention as in claim 1 wherein said first engaging finger is located approximately midway between said first end and said second end of said slider.

7. The invention as in claim 1 wherein said first uneven surface includes a first protrusion and a second protrusion.

8. The invention as in claim 7 wherein said first engaging finger sequentially contacts said protrusions.

9. The invention as in claim 7 wherein said first uneven surface includes a third protrusion.

10. The invention as in claim 9 wherein said protrusions have spacing between adjacent protrusions and said spacing between said first protrusion and said second protrusion is substantially equal to said spacing between said second protrusion and said third protrusion.

11. The invention as in claim 9 wherein said protrusions have spacing between adjacent protrusions and said spacing between said first protrusion and said second protrusion is less than said spacing between said second protrusion and said third protrusion.

12. The invention as in claim 7 wherein said protrusions have a height and said height of said first protrusion is substantially equal to said height of said second protrusion.

13. The invention as in claim 7 wherein said protrusions have a height and said height of said first protrusion is less than said height of said second protrusion.

14. The invention as in claim 7 wherein said protrusions have a width and said width of said first protrusion is substantially equal to said width of said second protrusion.

15. The invention as in claim 7 wherein said protrusions have a width and said width of said first protrusion is less than said width of said second protrusion.

16. The invention as in claim 7 wherein said protrusions are shaped as rectangles.

17. The invention as in claim 7 wherein said protrusions are shaped as semi-circles.

18. The invention as in claim 7 wherein said protrusions are shaped as triangles.

19. The invention as in claim 7 wherein said protrusions have a rounded shape.

20. The invention as in claim 1 wherein the fastening strips comprise shear action fastening strips.

21. The invention as in claim 1 wherein the fastening strips comprise U-channel type fastening strips.

22. The invention as in claim 1 wherein the fastening strips comprise arrowhead type fastening strips.

23. The invention as in claim 1 wherein the fastening strips comprise rolling action fastening strips.

24. The invention as in claim 1 wherein one of said fastening strips having a second uneven surface, said slider further comprising a second engaging finger, said second engaging finger contacts said second uneven surface, said contact between said second engaging finger and said second uneven surface produces an audible indication of movement of said slider.

25. The invention as in claim 24 wherein said contact between said second engaging finger and said second uneven surface produces an audible indication of occlusion of said interlocking fastening strips.

26. The invention as in claim 24 wherein said contact between said second engaging finger and said second uneven surface produces a tactile indication of occlusion of said interlocking fastening strips.

27. The invention as in claim 24 wherein said second engaging finger is located substantially near the first end of said slider.

28. The invention as in claim 24 wherein said second engaging finger is located substantially near the second end of said slider.

29. The invention as in claim 24 wherein said second engaging finger is located approximately midway between said first end and said second end of said slider.

30. The invention as in claim 24 wherein said second uneven surface includes a first protrusion and a second protrusion.

31. The invention as in claim 30 wherein said second

engaging finger sequentially contacts said protrusions.

32. The invention as in claim 30 wherein said second uneven surface includes a third protrusion.

33. The invention as in claim 32 wherein said protrusions have spacing between adjacent protrusions and said spacing between said first protrusion and said second protrusion is substantially equal to said spacing between said second protrusion and said third protrusion.

34. The invention as in claim 32 wherein said protrusions have spacing between adjacent protrusions and said spacing between said first protrusion and said second protrusion is less than said spacing between said second protrusion and said third protrusion.

35. The invention as in claim 30 wherein said protrusions have a height and said height of said first protrusion is substantially equal to said height of said second protrusion.

36. The invention as in claim 30 wherein said protrusions have a height and said height of said first protrusion is less than said height of said second protrusion.

37. The invention as in claim 30 wherein said protrusions have a width and said width of said first protrusion is substantially equal to said width of said second protrusion.

38. The invention as in claim 30 wherein said protrusions have a width and said width of said first protrusion is less than said width of said second

protrusion.

39. The invention as in claim 24 wherein said protrusions are shaped as rectangles.

40. The invention as in claim 24 wherein said protrusions are shaped as semi-circles.

41. The invention as in claim 24 wherein said protrusions are shaped as triangles.

42. The invention as in claim 24 wherein said protrusions have a rounded shape.

43. The invention as in claim 24 wherein the fastening strips comprise shear action fastening strips.

44. The invention as in claim 24 wherein the fastening strips comprise U-channel type fastening strips.

45. The invention as in claim 24 wherein the fastening strips comprise arrowhead type fastening strips.

46. The invention as in claim 24 wherein the fastening strips comprise rolling action fastening strips.

47. The invention as in claim 1 wherein said first fastening strip has a top surface, said first uneven surface is located on said top surface.

48. The invention as in claim 1 wherein said first fastening strip has a side, said first uneven surface is located on said side.

49. The invention as in claim 48 wherein said side

has an exterior surface, said first uneven surface is located on said exterior surface.

50. The invention as in claim 48 wherein said side has an interior surface, said first uneven surface located on said interior surface.

51. The invention as in claim 1 wherein said first fastening strip has a closure portion, said first uneven surface is located on said closure portion.

52. A slider for a first fastening strip and a second fastening strip arranged to be interlocked over a predetermined length, one of the fastening strips having a first uneven surface, the slider comprising a first engaging finger, said slider having a first end and a second end, said slider facilitates the occlusion of the fastening strips when moved toward a first end of the fastening strips and deocclusion of the fastening strips when moved towards a second end of the fastening strips by slidably engaging the first and the second fastening strips, said first engaging finger contacts the first uneven surface, said contact between said first engaging finger and the first uneven surface produces a sensory indication of movement of said slider.

53. The invention as in claim 52 wherein said contact between said first engaging finger and the first uneven surface produces a tactile indication of occlusion of the interlocking fastening strips.

54. The invention as in claim 52 wherein said contact between said first engaging finger and the first uneven surface produces an audible indication of occlusion of the interlocking fastening strips.

55. The invention as in claim 52 wherein said first engaging finger is located substantially near said first end of said slider.

56. The invention as in claim 52 wherein said first engaging finger is located substantially near said second end of said slider.

57. The invention as in claim 52 wherein said first engaging finger is located approximately midway between said first end and said second end of said slider.

58. The invention as in claim 52 wherein one of the fastening strips having a second uneven surface, said slider further comprising a second engaging finger, said second engaging finger contacts the second uneven surface, said contact between said second engaging finger and the second uneven surface produces an audible indication of movement of said slider.

59. The invention as in claim 58 wherein said contact between said second engaging finger and the second uneven surface produces an audible indication of occlusion of the interlocking fastening strips.

60. The invention as in claim 58 wherein said contact between said second engaging finger and the second uneven surface produces a tactile indication of occlusion of the interlocking fastening strips.

61. The invention as in claim 58 wherein said second engaging finger is located substantially near the first end of said slider.

62. The invention as in claim 58 wherein said second engaging finger is located substantially near the second end of said slider.

63. The invention as in claim 58 wherein said second engaging finger is located approximately midway between said first end and said second end of said slider.

64. A container comprising first and second sidewalls, said first and second sidewalls including mating first and second fastening strips respectively, said first and second fastening strips arranged to be interlocked over a predetermined length, one of said fastening strips having a first uneven surface; and

a slider with a first engaging finger, said slider having a first end and a second end, said slider facilitates the occlusion of said fastening strips when moved toward a first end of said fastening strips and deocclusion of said fastening strips when moved towards a second end of said fastening strips by slidably engaging said first and said second fastening strips, said first engaging finger contacts said first uneven surface, said contact between said first engaging finger and said first uneven surface produces a sensory indication of movement of said slider.

65. The invention as in claim 64 wherein said contact between said first engaging finger and said first uneven surface produces a tactile indication of occlusion of said interlocking fastening strips.

66. The invention as in claim 64 wherein said contact between said first engaging finger and said first uneven surface produces an audible indication of occlusion of said interlocking fastening strips.

67. The invention as in claim 64 wherein said first uneven surface includes a first protrusion and a second protrusion.

68. The invention as in claim 67 wherein said first engaging finger sequentially contacts said protrusions.

69. The invention as in claim 67 wherein said first uneven surface includes a third protrusion.

70. The invention as in claim 64 wherein one of said fastening strips having a second uneven surface, said slider further comprising a second engaging finger, said second engaging finger contacts said second uneven surface, said contact between said second engaging finger and said second uneven surface produces an audible indication of movement of said slider.

71. The invention as in claim 64 wherein said first fastening strip has a top surface, said first uneven surface is located on said top surface.

72. The invention as in claim 64 wherein said first fastening strip has a side, said first uneven surface is located on said side.

73. The invention as in claim 72 wherein said side has an exterior surface, said first uneven surface is located on said exterior surface.

74. The invention as in claim 72 wherein said side has an interior surface, said first uneven surface located on said interior surface.

75. The invention as in claim 64 wherein said first fastening strip has a closure portion, said first uneven surface is located on said closure portion.

76. A method for using a closure device comprising the steps of:

- providing a first fastening strip,
- providing a second fastening strip,
- providing one of said fastening strips with a first uneven surface,
- providing a slider with a first engaging finger, said slider having a first end and a second end,
- moving said slider toward a first end of said fastening strips to facilitate the occlusion of said fastening strips by slidably engaging said first and said second fastening strips, said first engaging finger contacts said first uneven surface, said contact between said first engaging finger and said first uneven surface produces a sensory indication of movement of said slider.

77. The invention as in claim 76 wherein said contact between said first engaging finger and said first uneven surface produces a tactile indication of occlusion of said interlocking fastening strips.

78. The invention as in claim 76 wherein said contact between said first engaging finger and said first uneven surface produces an audible indication of occlusion of said interlocking fastening strips.

79. The invention as in claim 76 further providing said first uneven surface with a first protrusion and a second protrusion.

80. The invention as in claim 79 wherein said first

engaging finger sequentially contacts said protrusions.

81. The invention as in claim 79 further providing said first uneven surface with a third protrusion.

82. The invention as in claim 76 further providing one of said fastening strips with a second uneven surface, providing said slider with a second engaging finger, said second engaging finger contacts said second uneven surface, said contact between said second engaging finger and said second uneven surface produces an audible indication of movement of said slider.

83. The invention as in claim 76 further providing said first fastening strip with a top surface, said first uneven surface is located on said top surface.

84. The invention as in claim 76 further providing said first fastening strip with a side, said first uneven surface is located on said side.

85. The invention as in claim 84 further providing said side with an exterior surface, said first uneven surface is located on said exterior surface.

86. The invention as in claim 84 further providing said side with an interior surface, said first uneven surface located on said interior surface.

87. The invention as in claim 84 further providing said first fastening strip with a closure portion, said first uneven surface is located on said closure portion.

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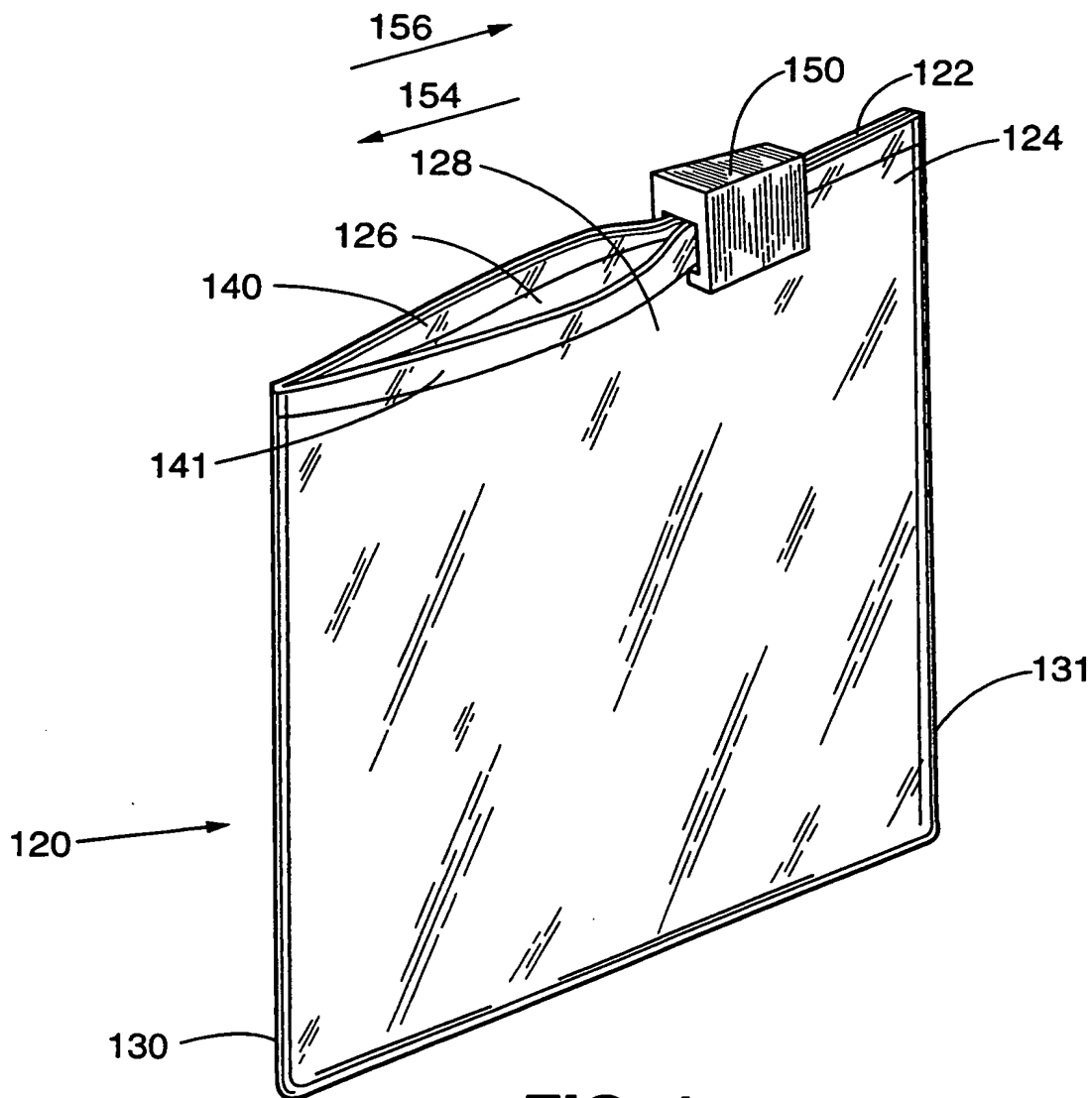


FIG. 1

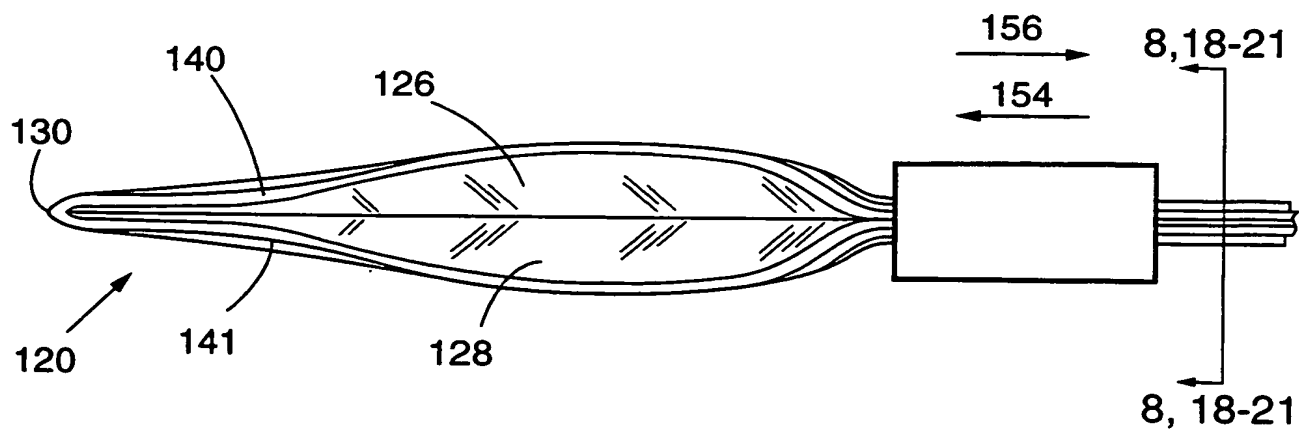


FIG. 2

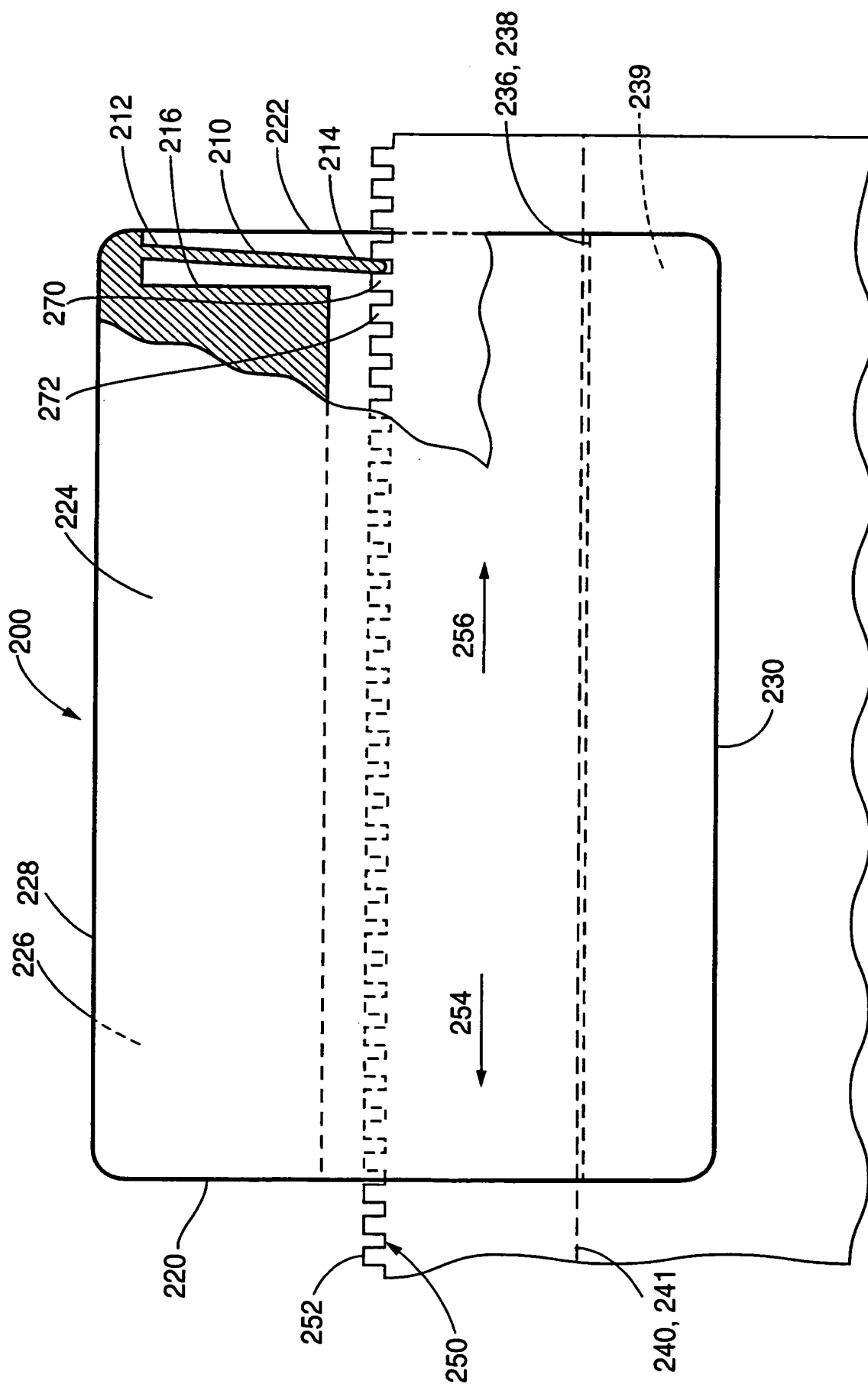


FIG. 3

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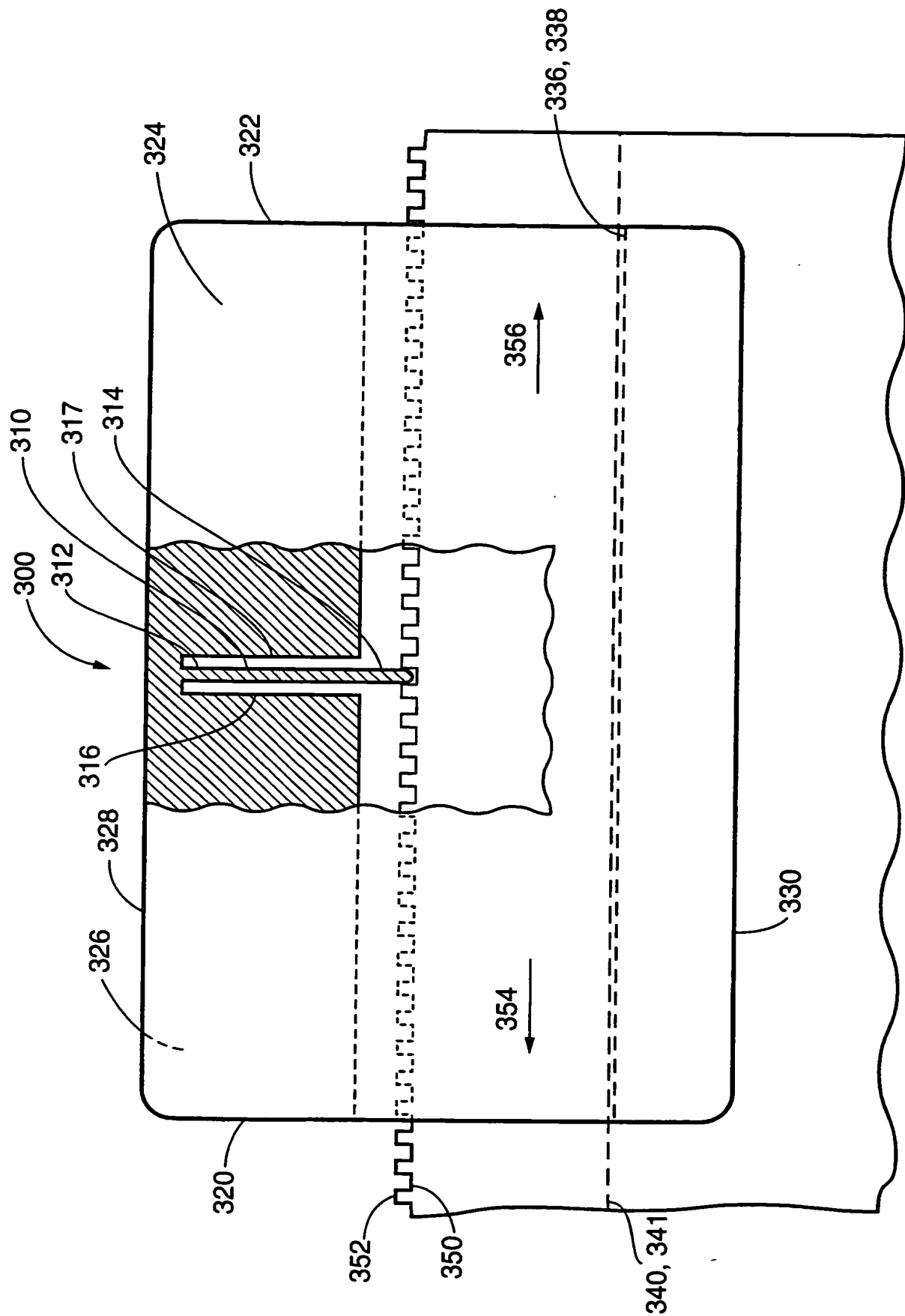


FIG. 4

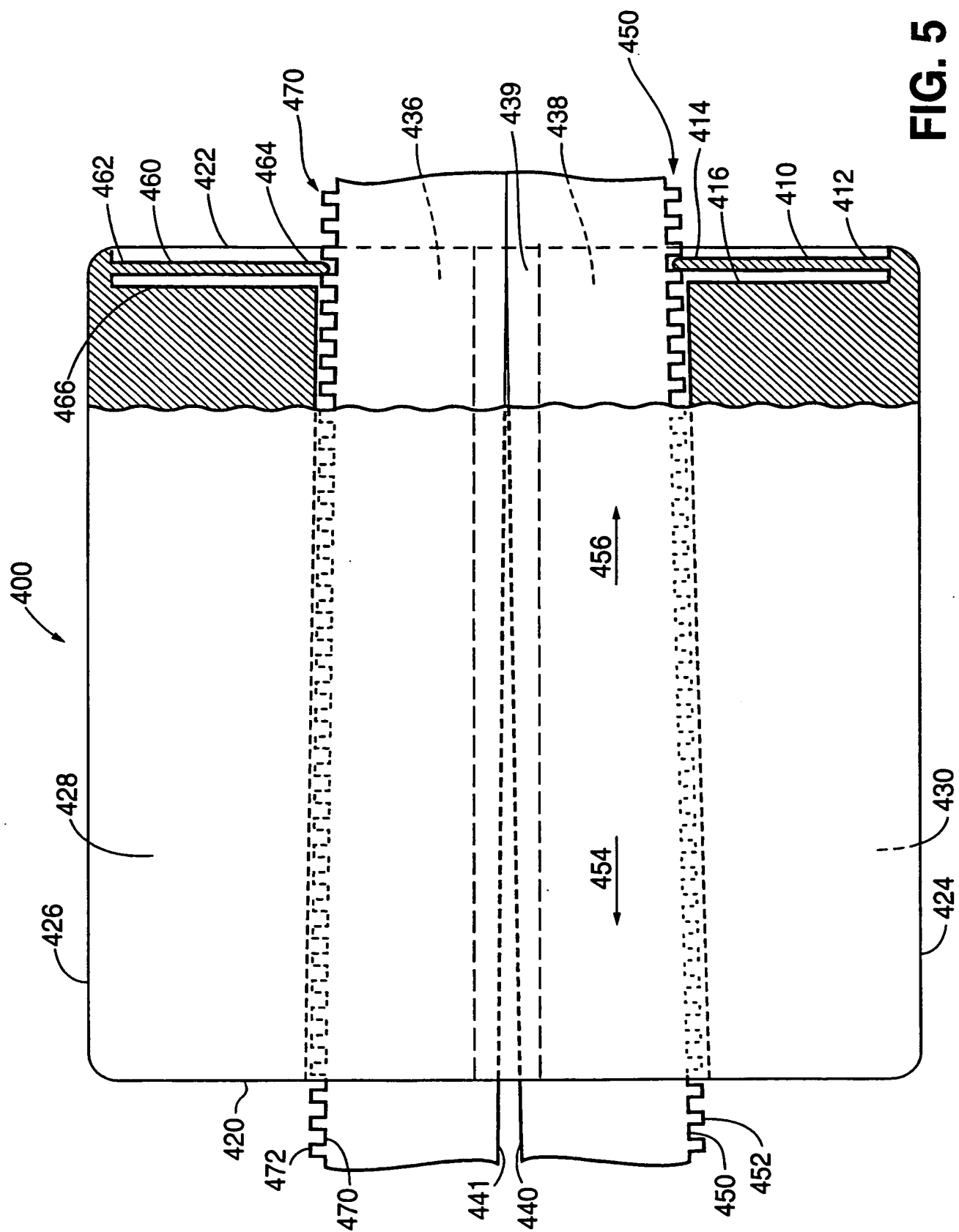


FIG. 5

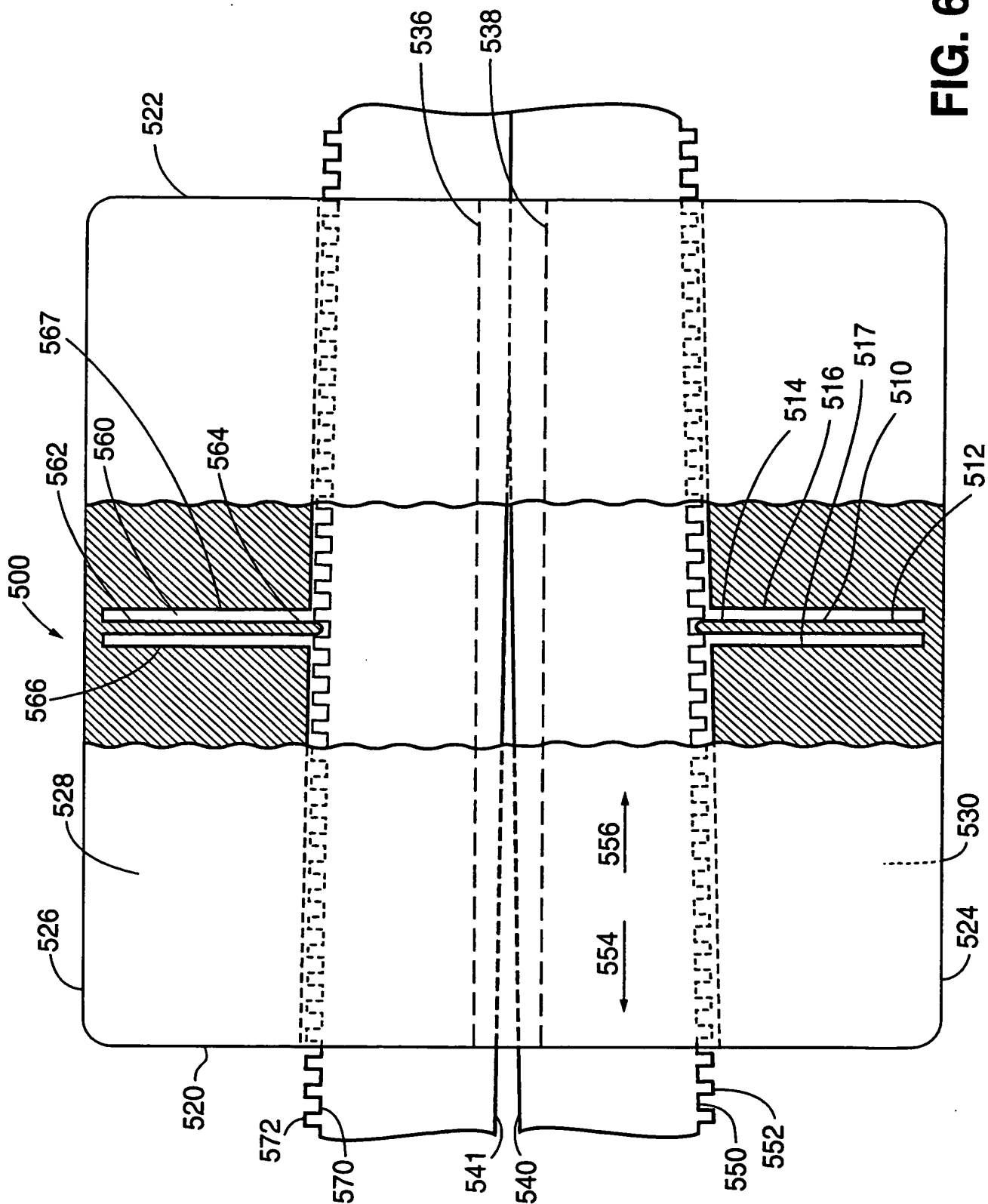


FIG. 6

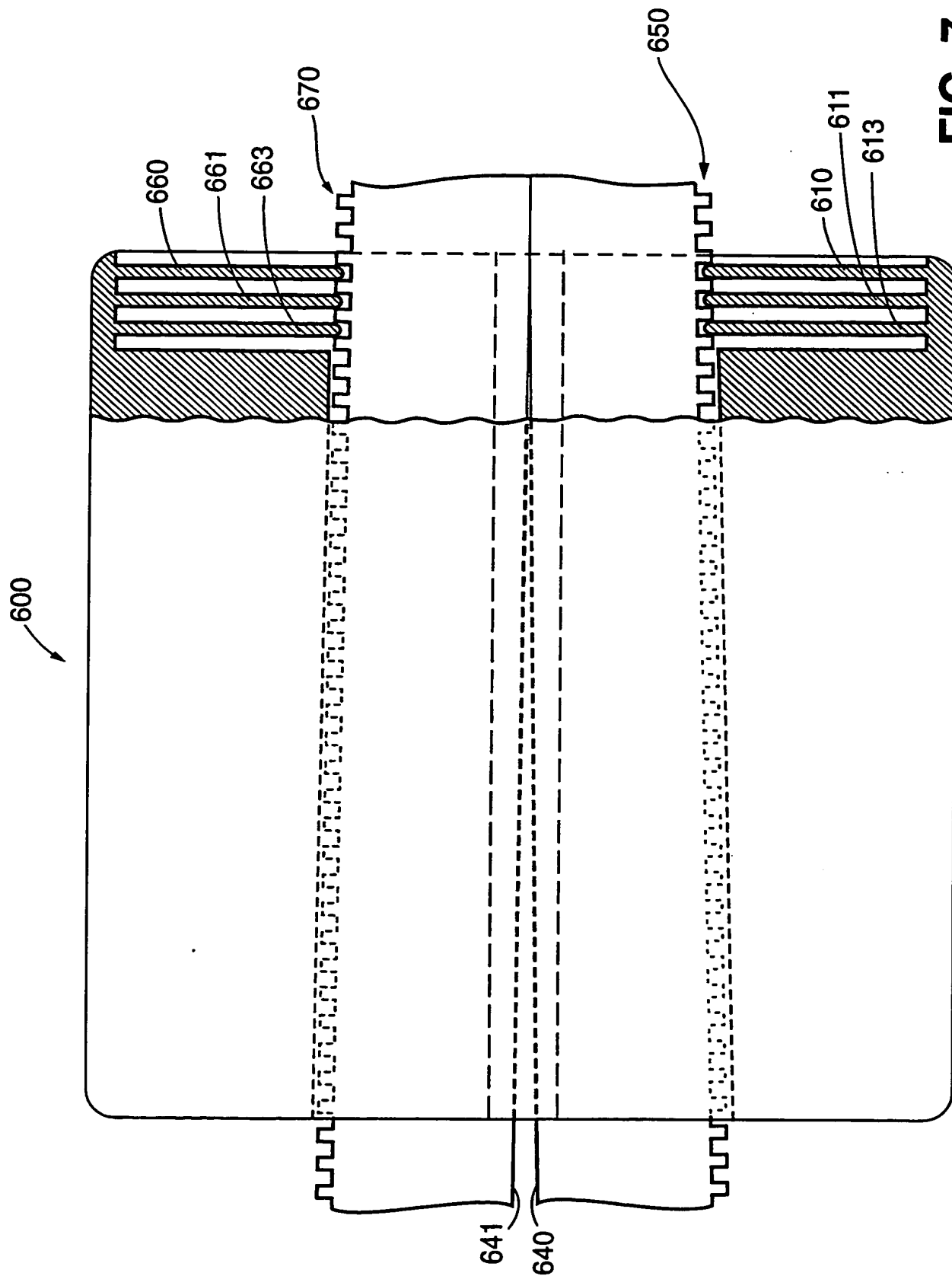


FIG. 7

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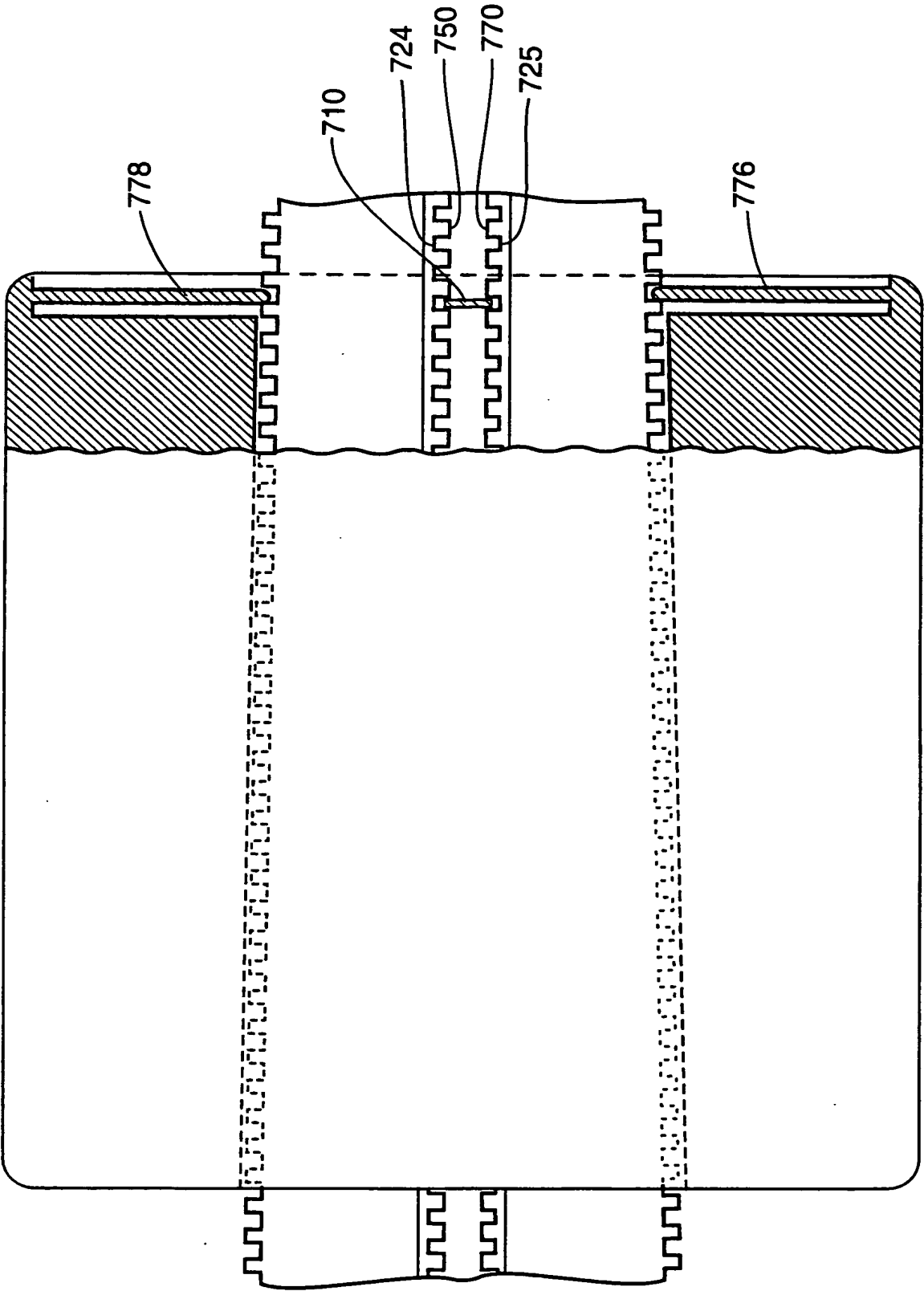


FIG. 9

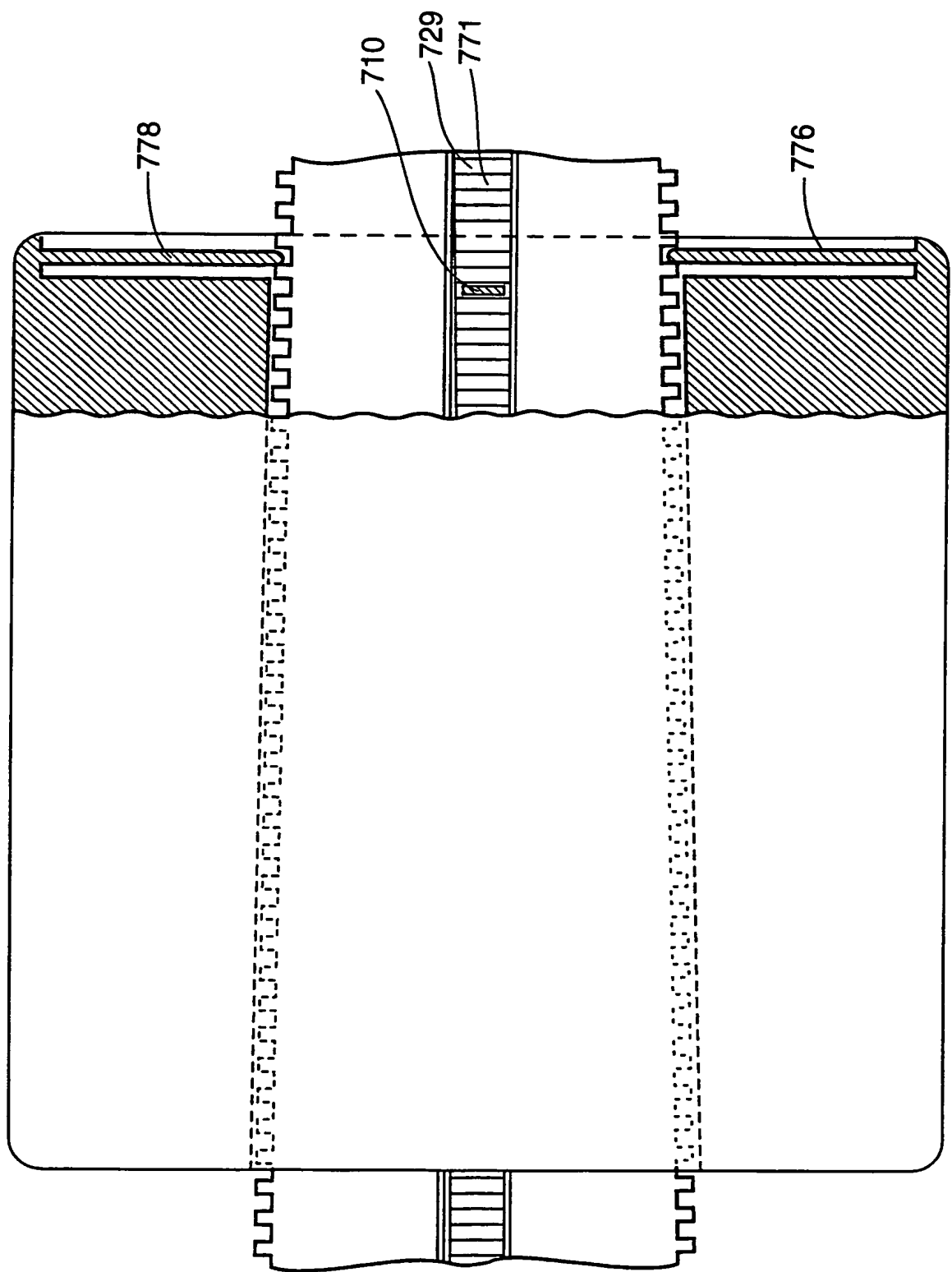


FIG. 10

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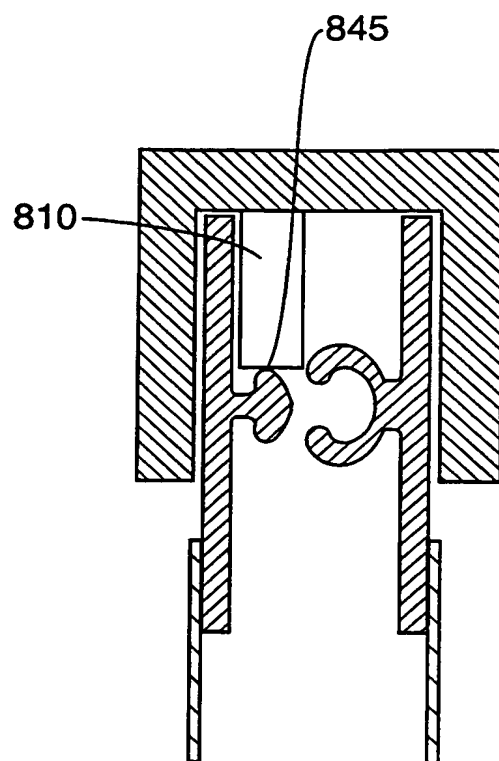


FIG. 11

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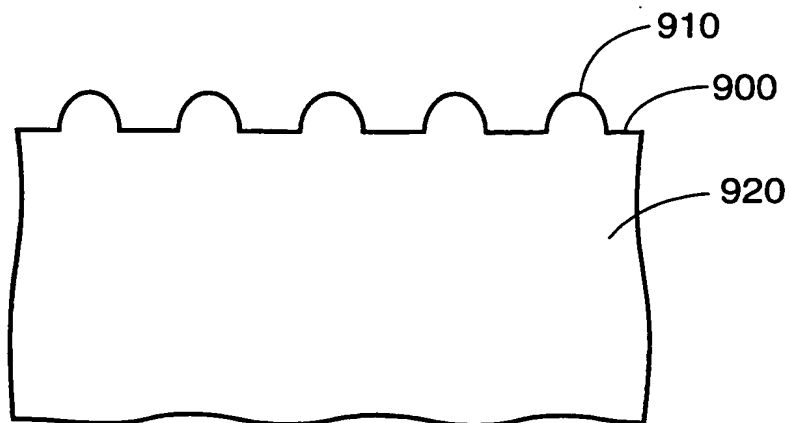


FIG. 12

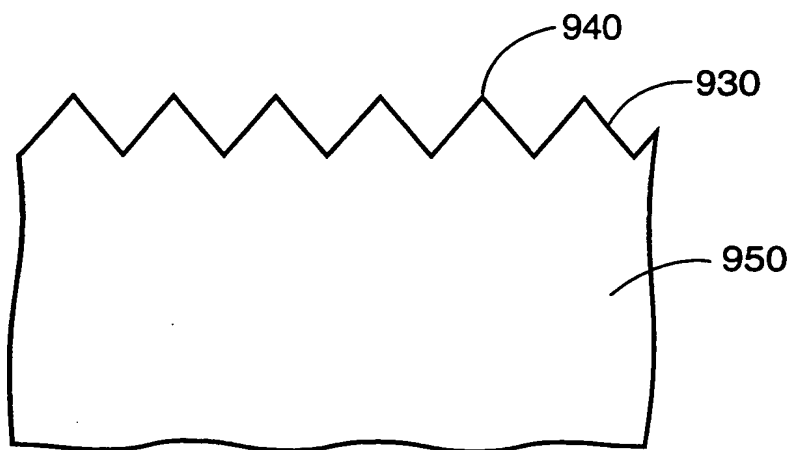


FIG. 13

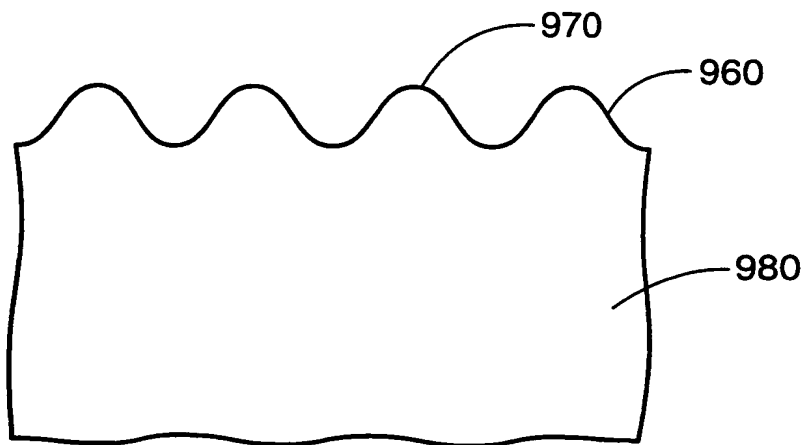


FIG. 14

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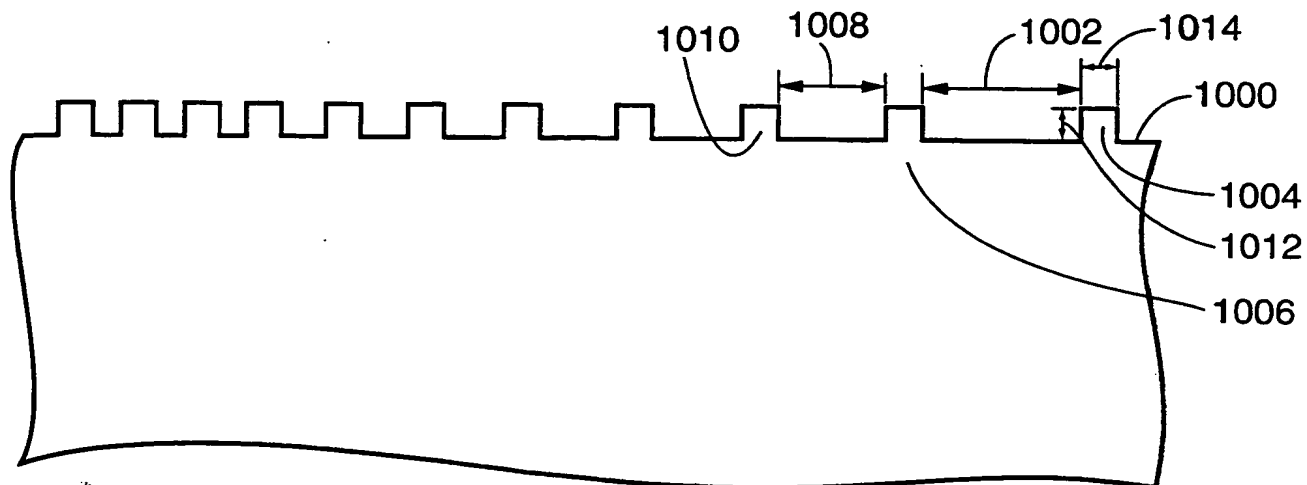


FIG. 15

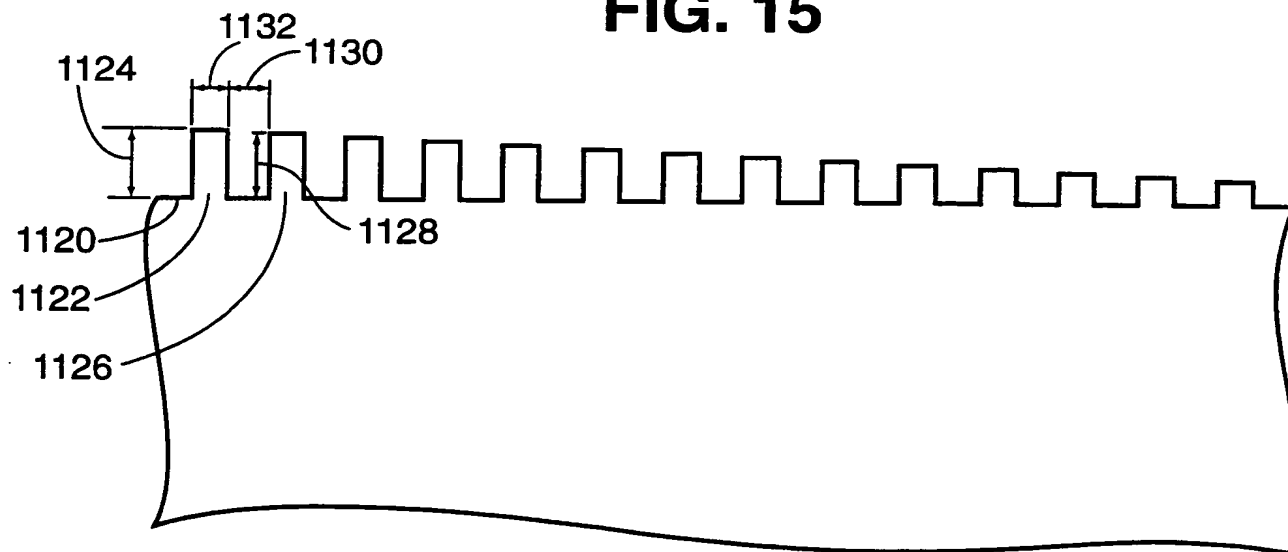


FIG. 16

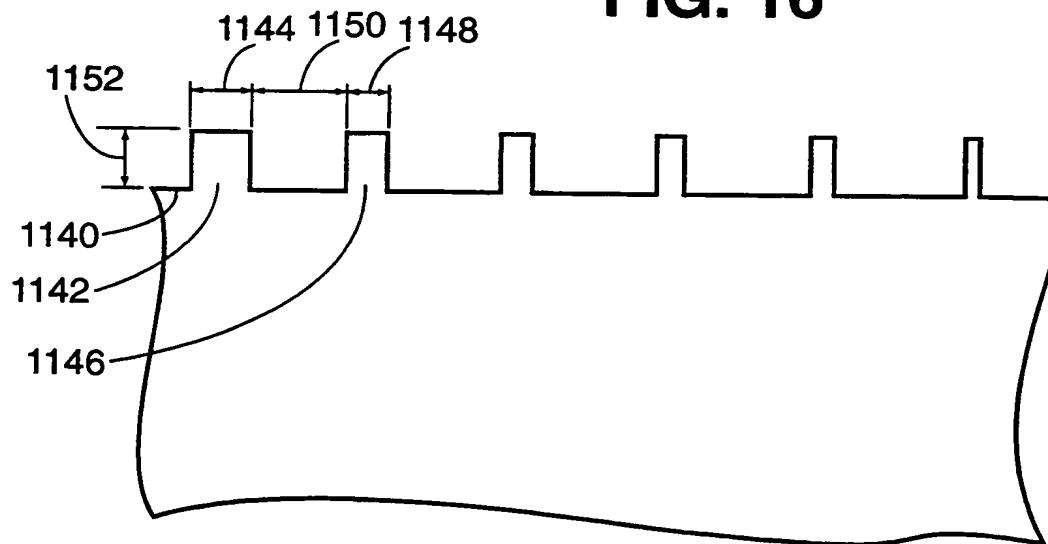


FIG. 17

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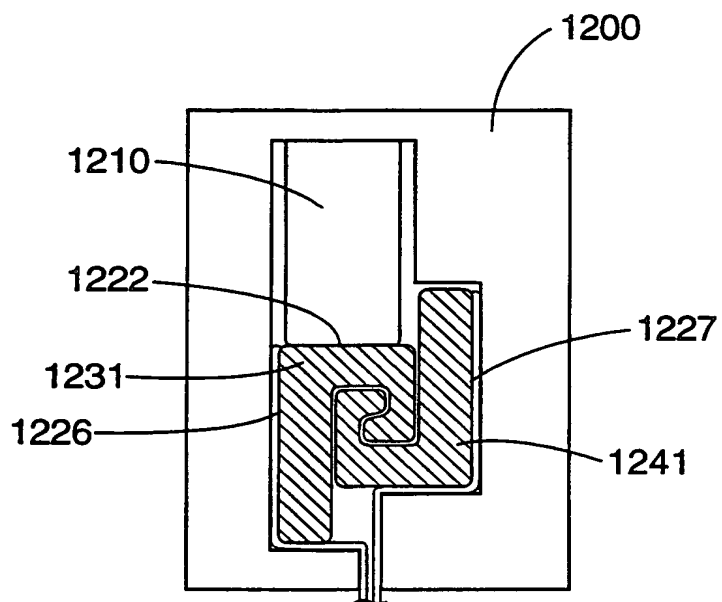


FIG. 18

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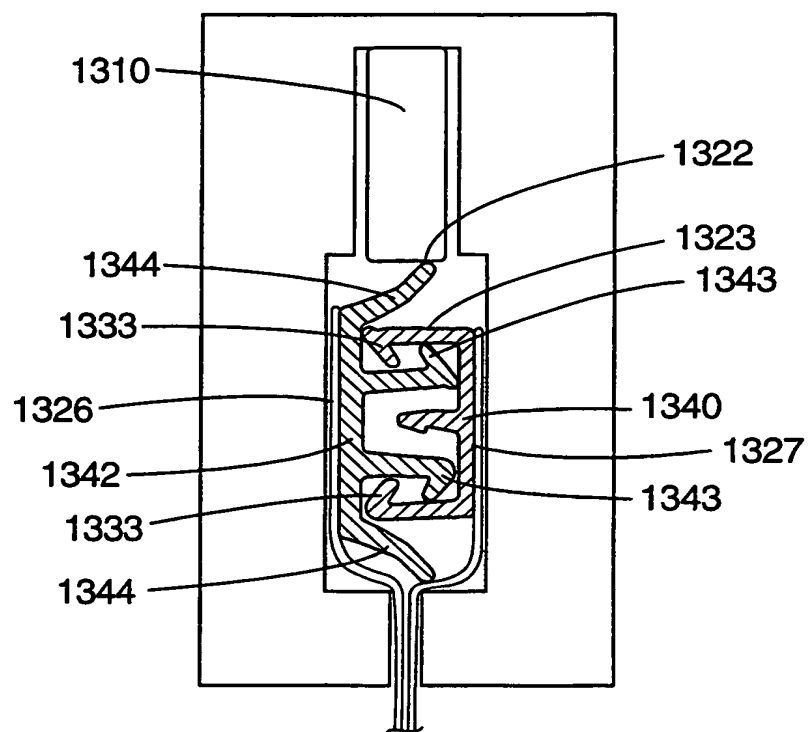


FIG. 19

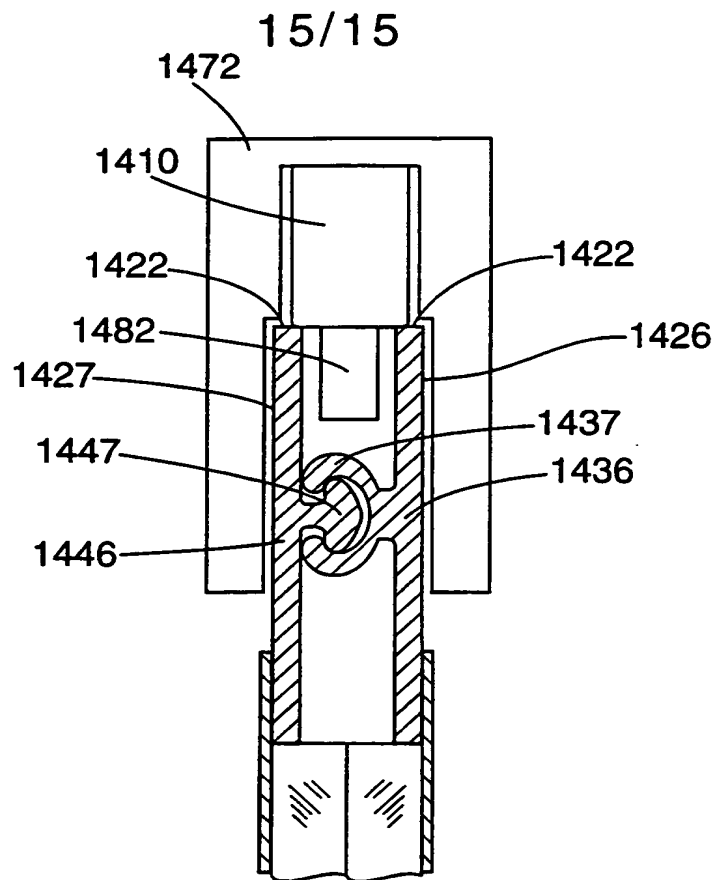


FIG. 20

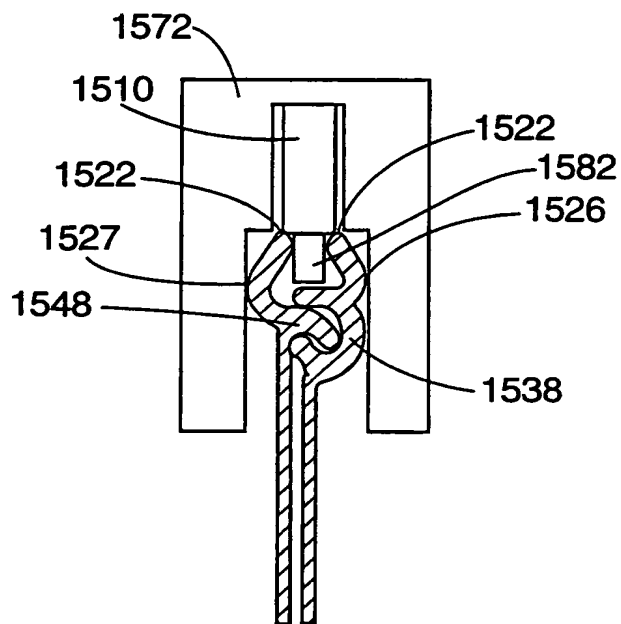


FIG. 21

INTERNATIONAL SEARCH REPORT

 International application No.
 PCT/US99/13191

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A44B 19/00 ; A41H 37/00

US CL :24/587, 400, 399, 30.5R ; 383/63 ; 156/66, 308.4

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 24/587, 400, 399, 30.5R, 30.5P, 389, 576 ; 383/63, 65 ; 156/66, 308.4

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,199,845 A (AUSNIT) 29 APRIL 1980 (29/04/80) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 3,713,923 A (LAGUERRE) 30 JANUARY 1973 (30/01/73) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 5,403,094 A (TOMIC) 04 APRIL 1995 (04/04/95) . SEE THE ENTIRE DOCUMENT	1 - 87
Y	US 5,138,750 A (GUNDLACH ET AL) 18 AUGUST 1992 (18/08/92) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 4,736,496 A (FISHER ET AL) 12 APRIL 1988 (12/04/88) . SEE THE ENTIRE DOCUMENT .	1 - 87

☒ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
E earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*A* document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 13 SEPTEMBER 1999	Date of mailing of the international search report 15 OCT 1999
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer: <i>Victor Sakran</i> VICTOR SAKRAN Telephone No. (703) 308-2224

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/13191

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2,871,539 A (SWAN) 03 FEBRUARY 1959 (03/02/59). SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 3,173,184 A (AUSNIT) 16 MARCH 1965 (16/03/65) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 3,959,856 A (AUSNIT) 01 JUNE 1976 (01/06/76) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 5,722,128 A (TONEY ET AL) 03 MARCH 1998 (03/03/98) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 2,756,172 A (KIDD) 24 JULY 1956 (24/07/56). SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 5,664,299 A (PORCHIA ET AL) 09 SEPTEMBER 1997 (09/09/97) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 5,448,808 A (GROSS) 12 SEPTEMBER 1995 (12/09/95) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 5,442,837 A (MORGAN) 22 AUGUST 1995 (22/08/95). SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 5,426,830 A (RICHARDSON ET AL) 27 JUNE 1995 (27/06/95) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 5,301,395 A (RICHARDSON ET AL) 12 APRIL 1994 (12/04/94) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 5,283,932 A (RICHARDSON ET AL) 08 FEBRUARY 1994 (08/02/94) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 5,161,286 A (HERRINGTON, JR. ET AL) 10 NOVEMBER 1992 (10/11/92) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 5,140,727 A (DAIS ET AL) 25 AUGUST 1992 (25/08/92) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 5,131,121 A (HERRINGTON, JR. ET AL) 21 JULY 1992 (21/07/92) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 5,070,583 A (HERRINGTON) 10 DECEMBER 1991 (10/12/91) . SEE THE ENTIRE DOCUMENT .	1 - 87

INTERNATIONAL SEARCH REPORT

International application No.:
PCT/US99/13191

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,067,208 A (HERRINGTON, JR. ET AL) 26 NOVEMBER 1991 (26/11/91) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 5,010,627 A (HERRINGTON ET AL) 30 APRIL 1991 (30/04/91) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 5,007,143 A (HERRINGTON) 16 APRIL 1991 (16/04/91) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 5,007,142 A (HERRINGTON) 16 APRIL 1991 (16/04/91) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 3,426,396 A (LAGUERRE) 11 FEBRUARY 1969 (11/02/69) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 3,115,689 A (JACOBS) 31 DECEMBER 1963 (31/12/63) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 3,054,434 A (AUSNIT ET AL) 18 SEPTEMBER 1962 (18/09/62) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 5,020,194 A (HERRINGTON ET AL) 04 JUNE 1991 (04/06/91) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 3,122,807 A (AUSNIT) 03 MARCH 1964 (03/03/64) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 3,230,593 A (HERZ) 25 JANUARY 1966 (25/01/66) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 4,262,395 A (KOSKY) 21 APRIL 1981 (21/04/81) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 5,088,971 A (HERRINGTON) 18 FEBRUARY 1992 (18/02/92) . SEE THE ENTIRE DOCUMENT .	1 - 87
Y	US 5,405,478 A (RICHARDSON ET AL) 11 APRIL 1995 (11/04/95) . SEE THE ENTIRE DOCUMENT .	1 - 87